

## ABSTRACT

An issue of reducing a product manufacture unit cost exists in wireless IC chips which are required to be disposable because the wireless IC chips circulate in a massive scale and require a very high collection cost. It is possible to increase the communication distance of a wireless IC chip with an on-chip antenna simply contrived for reduction of the production unit cost by increasing the size of the antenna mounted on a wireless IC chip or by increasing the output power of a reader as in a conventional way. However, because of the circumstances of the applications used and the read accuracy of the reader, the antenna cannot be mounted on a very small chip in an in-chip antenna form. When an AC magnetic field is applied to an on-chip antenna from outside, eddy current is produced in principle because the semiconductor substrate is conductive. It has been found that the thickness of the substrate can be used as a design parameter because of the eddy current. Based on this finding, according to the invention, the thickness of the substrate is decreased to reduce or eliminate the energy loss due to the eddy current to utilize the electromagnetic wave energy for the semiconductor circuit operation as originally designed. With the thickness reduction, it is possible to increase the communication distance by preventing ineffective absorption of energy and thereby increasing

the current flowing through the on-chip antenna.